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CAECIDOTEA SALEMENSIS AND *C. FUSTIS*, NEW SUBTERRANEAN ASELLIDS FROM THE SALEM PLATEAU (CRUSTACEA: ISOPODA: ASELLIDAE)

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Abstract.—Two species of *Caecidotea* belonging to the asellid *Hobbsi* Group are described from the Salem Plateau Section of the Ozark Plateau Province. *Caecidotea salemensis* is a widespread and common inhabitant of subterranean habitats in the central part of the Salem Plateau in both Arkansas and Missouri. *Caecidotea fustis* is known only from subterranean habitats in the northeastern part of the plateau.

The Salem Plateau is a section of the Ozark Plateau physiographic province, which comprises parts of southern Missouri, northern Arkansas and western Illinois (Fig. 1). Several thousand caves and springs are known from the Ordovician limestones and dolomites prevalent in the region (Bretz, 1956; Bretz and Harris, 1961; Vineyard and Feder, 1974), from which four subterranean species of *Caecidotea* are currently known: *C. antricola* Creaser (1931), *C. dimorpha* Mackin and Hubricht (1940), *C. extensolinguala* (Fleming, 1972) and *C. serrata* (Fleming, 1972). Records of *Caecidotea stiladactyla* Mackin and Hubricht (1940) from the central Missouri part of the Salem Plateau are probably erroneous determinations of *C. fustis*. Two subterranean species are added to the list of the Salem Plateau isopod fauna herein, an accomplishment made possible largely by the collections of Leslie Hubricht (LH), James E. Gardner (JEG) and John L. Craig (JLC).

Caecidotea salemensis, new species
Figs. 2–5

Asellus tridentatus.—Fleming, 1972:254 (in part). *A.* spp.—Craig, 1977:83, 85, 87 (in part).

Material examined.—ARKANSAS: Lawrence Co., Imboden, deep cistern, 29 Aug. 1925, Byron C. Marshall, 61 ♂♂, 12 ♀♀ (USNM 59263). MISSOURI: Boone Co., stream in Hunter Cave, 5 mi NNW Ashland, 4 Aug. 1940, LH, 4 ♂♂, 20 ♀♀. Carter Co., Norris Cave, small quiet pools, 10 mi NW Van Buren, 29 Jan. 1979, JEG, 2 ♂♂. Dallas Co., Saltpeter Cave, 22 Nov. 1974, O. Hawksley, 4 ♂♂, 7 ♀♀. Douglas Co., seep, on bluff above North Fork of White River, W. of Roosevelt, 1 May 1940, LH, 19 ♂♂, 22 ♀♀; small spring on bluff near North Fork of White River, 7 mi E Richville, 1 June 1935, LH, 3 ♂♂, 3 ♀♀. Franklin Co., drip pools and stream, Mush-

room Cave, 2.5 mi E. Sullivan, 5 Apr. 1942, LH, 25 ♂♂, 11 ♀♀; same locality, 1 June 1974, JLC, 1 ♂, 1 ♀. Hickory Co., seep 5 mi W Urbana, 16 Mar. 1975, JLC, 21 juv, 3 ♀♀; same locality, 23 Mar. 1975, 3 ♀♀. Pettis Co., Hughesville, cistern, 20 Aug. 1932, A. Gurloff, 6 ♂♂, 5 ♀♀ (USNM 67700). Phelps Co., Lane Cave, small quiet pools, 1 mi N Yancy Mills, 17 Jan. 1979, JEG, 11 ♂♂, 8 ♀♀; Little Piney Cave, 7 mi SW Rolla, 15 May 1980, JEG, 1 ♂, 2 ♀♀; Zorumski Cave, 5 mi WSW Newburg, 17 Mar. 1980, JEG, 9 ♂♂, 2 ♀♀. Pulaski Co., Little Cave, beneath stones in riffles, 1 mi E. Devils Elbow, 6 Dec. 1978, JEG, 9 ♂♂, 6 ♀♀; same locality, 6 Aug. 1979, Julian J. Lewis, Teresa M. Lewis, JEG, 4 ♂♂, 2 ♀♀; York Cave, drip pools, 1.5 mi N Hanna, 28 Mar. 1942, LH, 5 ♂♂, 1 ♀; same locality, 21 May, 1978, JLC, 1 ♂, 1 ♀; McCann Cave #1, 4 mi W Waynesville, 6 Mar. 1976, JLC, 5 ♂♂, 7 ♀♀. Texas Co., Bat Cave, in small stream, 7 mi NE Success, 5 July 1940, LH, 1 ♂, 4 ♀♀ (USNM 108585); Unnamed Cave #15, 12 mi W Licking, 21 Apr. 1980, JEG, 9 ♂♂, 5 ♀♀. Washington Co., Hamilton Cave, drip pool, 5.5 mi SE Sullivan, 20 July 1940, LH, 6 ♂♂, 2 ♀♀.

A 12.5 mm male from Imboden, Arkansas is the holotype (USNM 59263), the other specimens from this locality are paratypes (USNM 181300). All of the material examined has been deposited in the National Museum of Natural History, Smithsonian Institution.

Description.—Eyeless, unpigmented. Longest male, 16.0 mm, body slender, linear, about 6.9× as long as wide, coxae visible in dorsal view; longest female, 9.8 mm. Margins of head, pereonites and telson very setose. Head about 1.8× as wide as long, anterior margin concave, rostrum lacking; postmandibular lobes moderately produced. Telson about 1.4× as long as wide, sides subparallel, caudomedial lobe moderately produced, broadly rounded.

Antenna 1 reaching middle of last segment of antenna 2 peduncle, flagellum of male of about 17–18 segments, esthete formula 3-0-1-0-1 (Fig. 2d); flagellum of female shorter, of about 11–12 segments. Antenna 2 reaching pereonite 7, last segment of peduncle about 1.3× length preceding segment, flagellum of about 70–84 segments.

Mandibles with 4-cuspate incisors and lacinia mobilis; spine row with about 14 spines in left, 17 spines in right mandible. Palp with plumose setae on distal segments. Maxilla 1, apex of outer lobe with 13 robust spines, inner lobe with 5 apical plumose setae. Maxilliped with about 7 retinacula.

Male pereopod 1 propus about 1.3× as long as wide; palm proximally with 1–2 small, robust spines, medial process subtriangular, separated from smaller rounded or slightly bicuspid distal process by U-shaped cleft (Figs. 3a; 5a–f); dactyl flexor margin with up to 5–6 spines, decreasing to 0–1 in mature individuals, and rounded process (Fig. 3d). Female pereopod 1 propus more slender, about 1.4× as long as wide, palm with 2 proximal spines, processes lacking; dactyl flexor margin with about 5 spines. Pereopod 4 more robust in male than female.

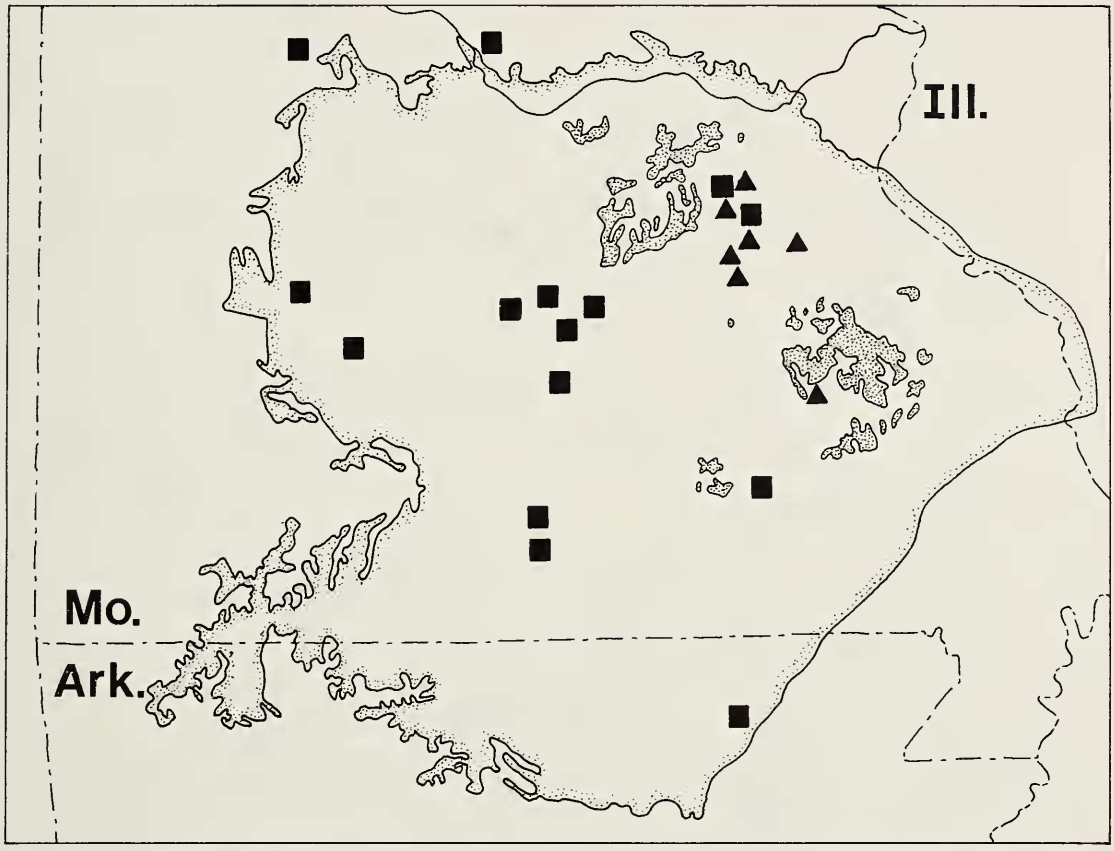

Fig. 1. The Salem Plateau Section (stippled around margins) of the Ozark Plateau Province, showing the ranges of *Caecidotea salemensis* (squares) and *C. fustis* (triangles); stippled areas within the Salem Plateau indicate areas where non-cavernous rocks occur.

Male pleopod 1 larger than pleopod 2; protopod about 0.7× length of exopod, with 3–4 retinacula; exopod about 2× as long as wide, with long plumose setae on distal margin and short setae on concave distal part of lateral margin. Male pleopod 2 exopod, proximal segment with 0–4 setae, distal segment suboval, bearing about 15 plumose setae along lateral and distal margins and about 7 non-plumose setae along mesial margin; endopod with prominent basal apophysis, tip with 3 processes: caudal process broadly rounded, forming a lateral shoulder; cannula short, cylindrical, endopodial groove prominent; mesial process distally curved, rectangular, obscuring cannula. Female pleopod 2 with 9–12 plumose setae along lateral and distal margins, anterior surface with numerous setae.

Pleopod 3 about 2× as long as wide, distal segment about 1.6× length of proximal segment, distal margin with about 20 long, plumose setae. Pleopod 4, exopod with setae along proximal lateral margin and single oblique sigmoid suture. Pleopod 5 exopod with setae along proximal lateral margin, and weak transverse suture.

Uropods of male very spatulate in mature specimens, slightly longer than telson. Uropods of female cylindrical, equal or subequal to length of telson.

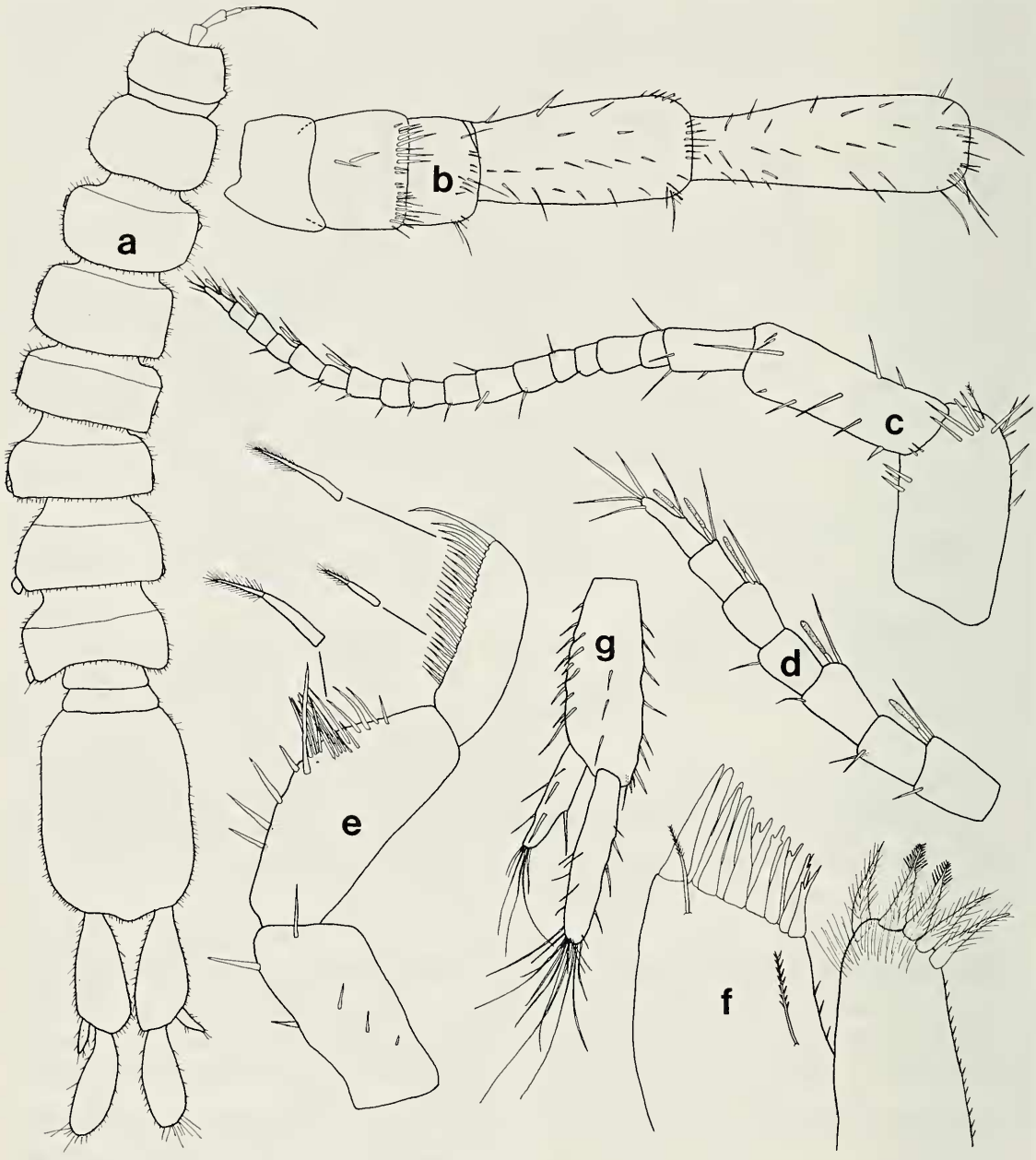

Fig. 2. *Caecidotea salemensis*: a–f from male paratype, g from female paratype: a, Habitus, dorsal; b, Antenna 2, proximal segments; c, Antenna 1; d, Same, distal segments; e, Mandibular palp; f, Maxilla 1; g, Uropod, dorsal.

Etymology.—Named after the Salem Plateau.

Relationships.—*Caecidotea salemensis* is closest morphologically to *C. tridentata* and two undescribed species from drain tiles in Missouri and Illinois (Lewis and Bowman, in press), and Floyd County, Indiana (Lewis, in prep.), referred to here as *Caecidotea* sp. #1 (Ill./Mo.) and *Caecidotea* sp. #2 (Ind.). *Caecidotea salemensis* is readily separated from these species

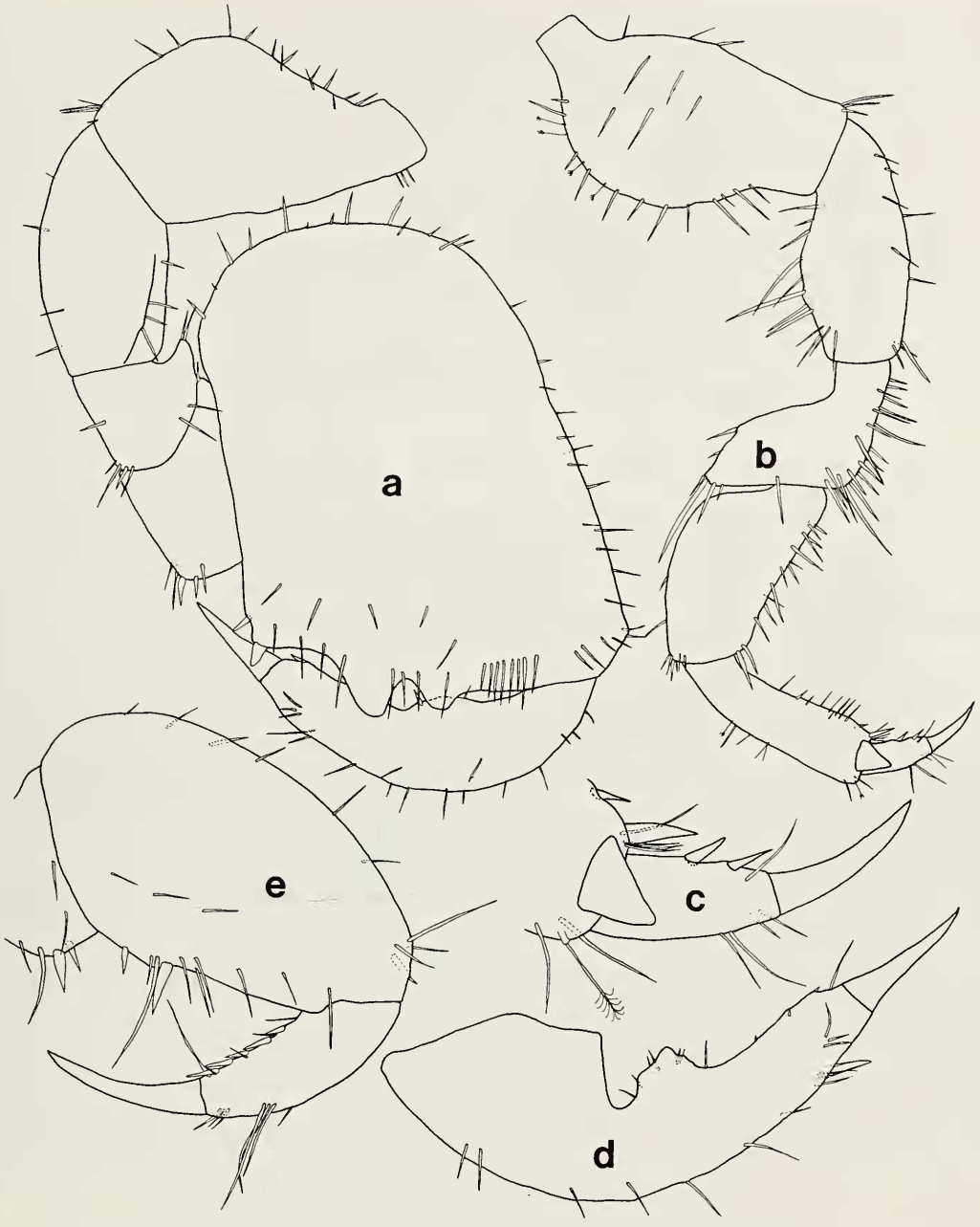

Fig. 3. *Caecidotea salemensis*: a–d from male paratype, e from female paratype: a, Pereopod 1; b, Pereopod 4; c, Same, dactyl; d, Pereopod 1, dactyl; e, Pereopod 1.

by the possession of a single sigmoid suture in pleopod 4; in the other three species two sutures are present. The palmar margins of the male pereopod 1 propus in *C. salemensis* and *C.* sp. #1 each bear one or two proximal spines, a subtriangular median process and a bicuspid distal process. *C. tridentata* differs in having a distinct fingerlike proximal process, while *C.* sp. #2 has a shorter, triangular proximal process.

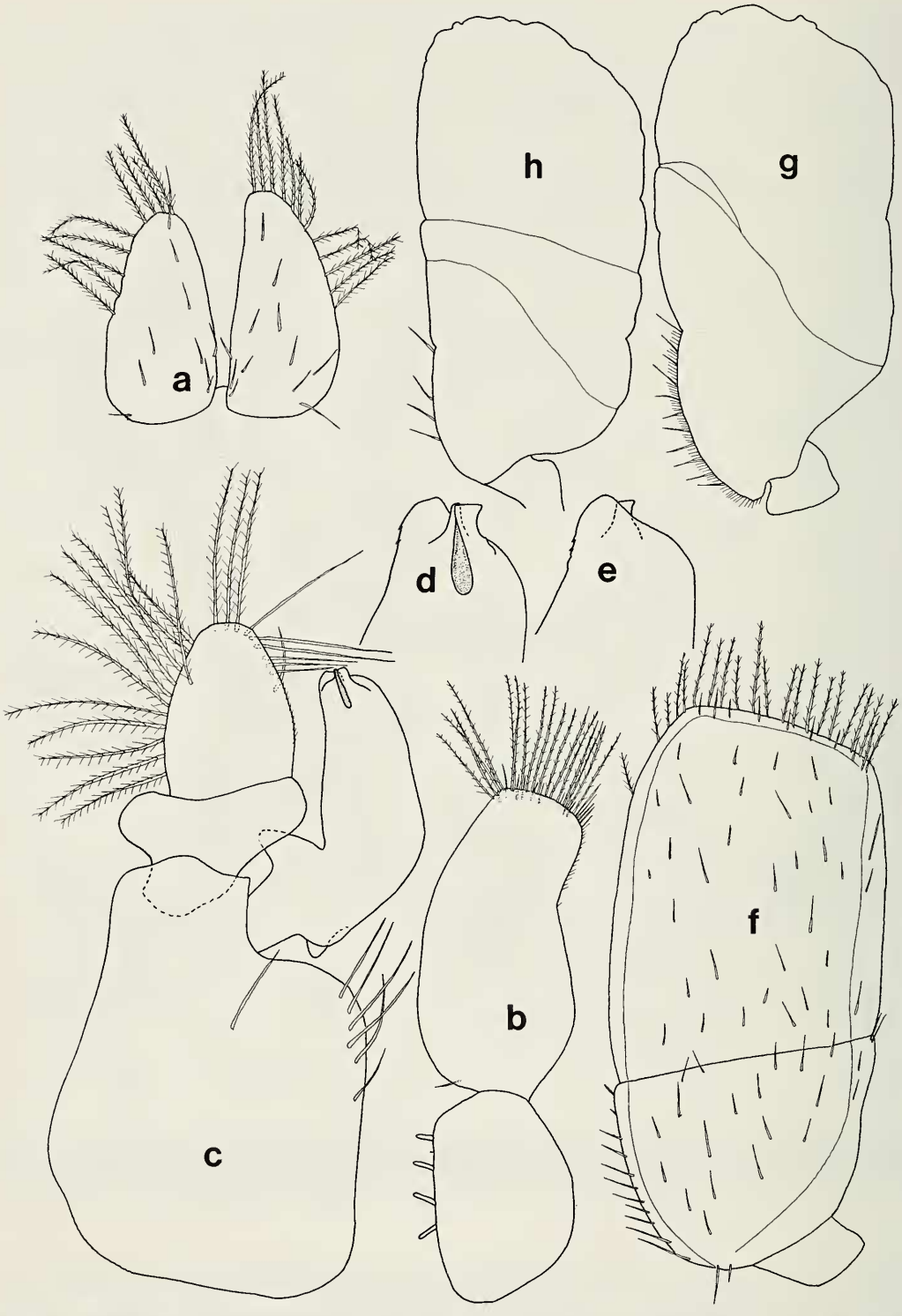

Fig. 4. *Caecidotea salemensis*: a from female paratype, b–h from male paratype: a, Pleopod 2; b, Pleopod 1; c, Pleopod 2; d, Same, tip of endopod, anterior; e, Same, posterior; f, Pleopod 3; g, Pleopod 4; h, Pleopod 5.

The male pleopod 1 of all 4 species is similar in having long setae only along the distal margin of the exopod. The male second pleopod endopod tips are also very similar, although the placement of the endopodial groove differs from one species to the next, and the relative sizes of the tip processes also help to characterize the species. In *C. salemensis, C.* sp. #1 and *C.* sp. #2, the groove is on the lateral side of the mesial process, but in *C. tridentata* it is on the mesial side of this process. The cannulas of *C. salemensis, C. tridentata* and *C.* sp. #2 differ from that of *C.* sp. #1 in being slender and low, mostly obscured from both the anterior and posterior aspects. In *C.* sp. #1 the cannula protrudes beyond the mesial and caudal processes, visible from both anterior and posterior aspects, and is recurved mesially.

The low, partially obscured cannula, extending in a line parallel to the axis of the endopod, plus the shape and setation of the male pleopod 1 of *Caecidotea salemensis,* are typical of the morphology of the species of Steeves' (1964) *Hobbsi* Group. Within this group *C. tridentata, C. salemensis, C.* sp. #1 and *C.* sp. #2 comprise an assemblage of closely related, allopatric species.

Habitat and distribution.—*Caecidotea salemensis* is known from the groundwater of caves, seeps, springs and cisterns. In caves it is usually taken from streams and drip pools. These habitats are markedly different from *C. tridentata, C.* sp. #1 and *C.* sp. #2, which are known only from drain tiles and wells in areas where caves do not occur. Thus, *C. salemensis* is a troglobite, whereas the other 3 species are phreatobites. *C. salemensis* occurs widely in the Salem Plateau and is also known from a few other localities near the edge of the plateau. Through much of its range *C. salemensis* is sympatric with *C. antricola,* a species which is distinct morphologically from *C. salemensis* (Steeves, 1966; Lewis and Bowman, in press).

Remarks.—Ovigerous females were present in collections taken in March, April and May with typically between 16 and 27 immatures present in the brood pouches.

Caecidotea fustis, new species
Figs. 6, 7

Asellus stiladactylus.—Fleming, 1972:254 (in part).

Material examined (all deposited in the National Museum of Natural History, Smithsonian Institution).—MISSOURI: Crawford Co., Bat Cave, 7 mi SE Leasburg, 16 Dec. 1973, JLC, 2 ♂♂; 24 May 1974, 2 ♂♂, 4 ♀♀; Bear Cave, 8.5 mi NE Steelville, 6 Aug. 1980, JEG, 5 ♂♂, 11 ♀♀; Nameless Cave, 16 Feb. 1974, JLC, 1 ♂, 1 ♀; Onondaga Cave, 4 mi SE Leasburg, 30 May 1974, JLC, 1 ♂, 4 ♀♀; Pool in Onyx Cave, on bluff above Brazil Creek,

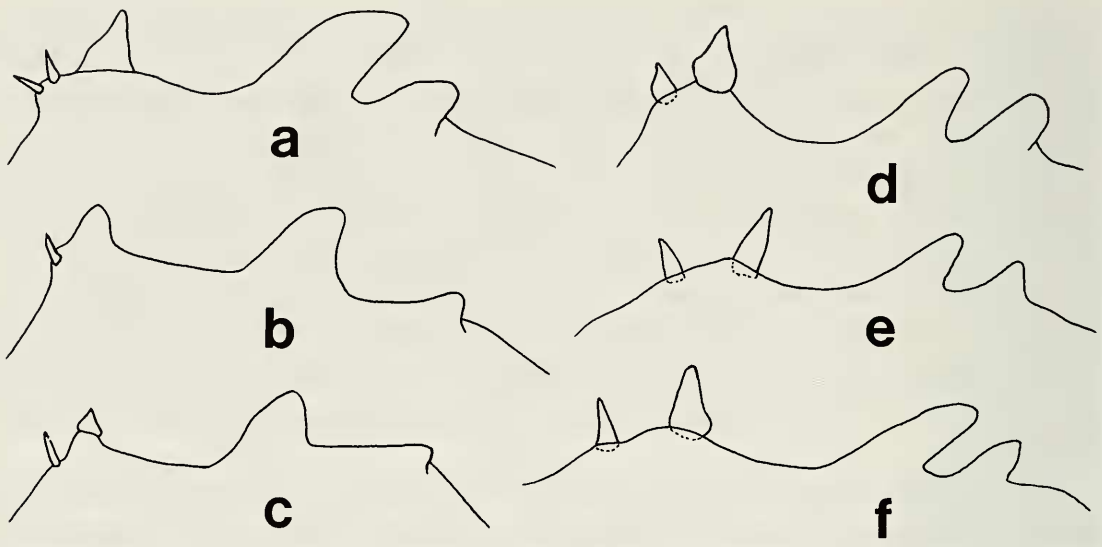

Fig. 5. *Caecidotea salemensis*: Variation of male pereopod 1 palmar margin (setae omitted): a, Little Cave; b, Cistern, Imboden; c, Same; d, Cistern, Hughesville; e, Texas Cave; f, Lane Cave (locality data in text).

3 mi N Campbell Bridge, 8 mi SE Bourbon, 20 July 1940, LH, 14 ♂♂, 4 ♀♀. Franklin Co., Copper Hollow Sink Cave, 8 Feb. 1958, O. Hawksley, 2 ♂♂, 6 ♀♀; Meramec Caverns (type-locality), drip pools, 2.5 mi SE Stanton, 16 Dec. 1939, LH, 11.5 mm ♂ holotype, USNM 181301 and 13 ♂♂ paratypes, USNM 181302; Seeps, 0.5 mi NW Mushroon Cave, 2.5 mi E Sullivan, 5 Apr. 1942, LH, 32 ♂♂, 22 ♀♀. Iron Co., seep, base of Taum Sauk Mountain, near Mina Sauk Falls, 5 mi NW Hogan, 18 Jan. 1942, LH, 9 ♂♂, 5 ♀♀. Washington Co., Corral Cave, 18 mi E Steelville, 21 Aug. 1980, JEG, 3 ♂♂, 9 ♀♀.

Description.—Eyes vestigial or absent; pigment absent or lightly scattered on dorsum. Longest male, 11.0 mm; body slender, linear, about 6.0× as long as wide; coxae visible in dorsal view. Margins of head, pereonites and telson moderately setose. Head about 1.3× as wide as long, anterior margin concave, postmandibular lobes slightly produced. Telson about 1.8× as long as wide, sides subparallel, caudomedial lobe low, poorly defined.

Antenna 1 reaching to middle of distal segment of antenna 2 peduncle; flagellum of about 13 segments, esthete formula 3-0-1-0-1 (Fig. 6b). Antenna 2 reaching about to anterior margin of telson; distal segment of peduncle about 1.3× length of preceding segment; flagellum of about 63 segments.

Mandibles with 4-cuspate incisors and lacinia mobilis; spine row with about 10 spines in left, 11 spines in right mandible. Palp with plumose setae on distal segments. Maxilla 1, apex of outer lobe with 13 robust spines; inner lobe with 5 apical plumose setae. Maxilliped with about 4 retinacula.

Male pereopod 1 propus about 1.5× as long as wide; palm with proximal spine, triangular medial process and bicuspid distal process; dactyl flexor margin with up to about 6 small spines, rounded process present in mature

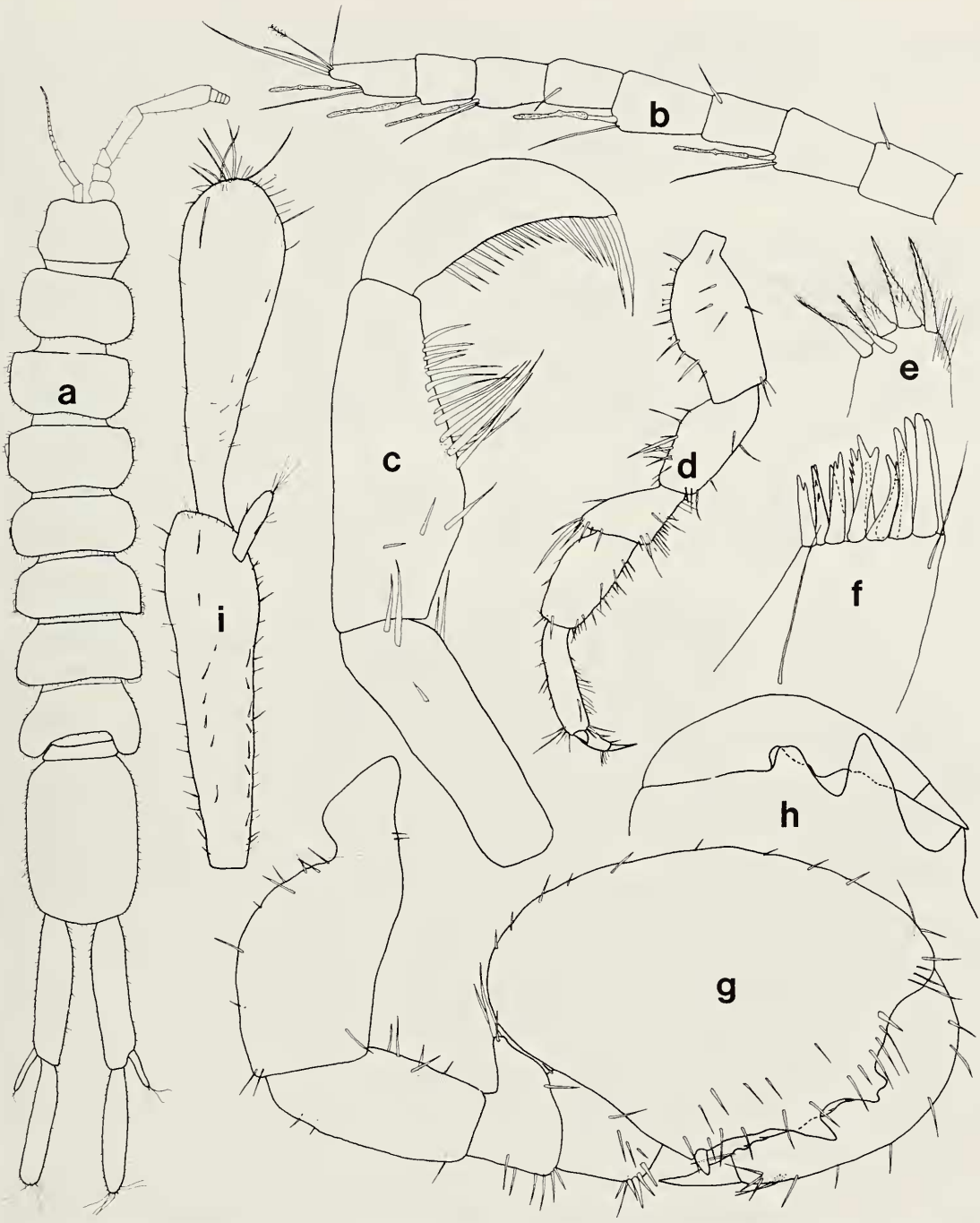

Fig. 6. *Caecidotea fustis*: a–g from male paratype, Meramec Caverns; h, i from male from Taum Sauk Mountain: a, Habitus, dorsal; b, Antenna 1, distal segments; c, Mandibular palp; d, Pereopod 4; e, Maxilla 1, inner lobe; f, Same, outer lobe; g, Pereopod 1; h, Pereopod 1, propus and dactyl, setae omitted; i, Uropod, dorsal.

specimens. Female pereopod 1 propus more slender, about 2× as long as wide, palm with proximal spine, processes lacking; dactyl flexor margin with about 3 spines. Pereopod 4 more robust in male than female.

Male pleopod 1 larger than pleopod 2; protopod about 0.6× length of exopod, with 4–5 retinacula; exopod about 2× as long as wide, with about

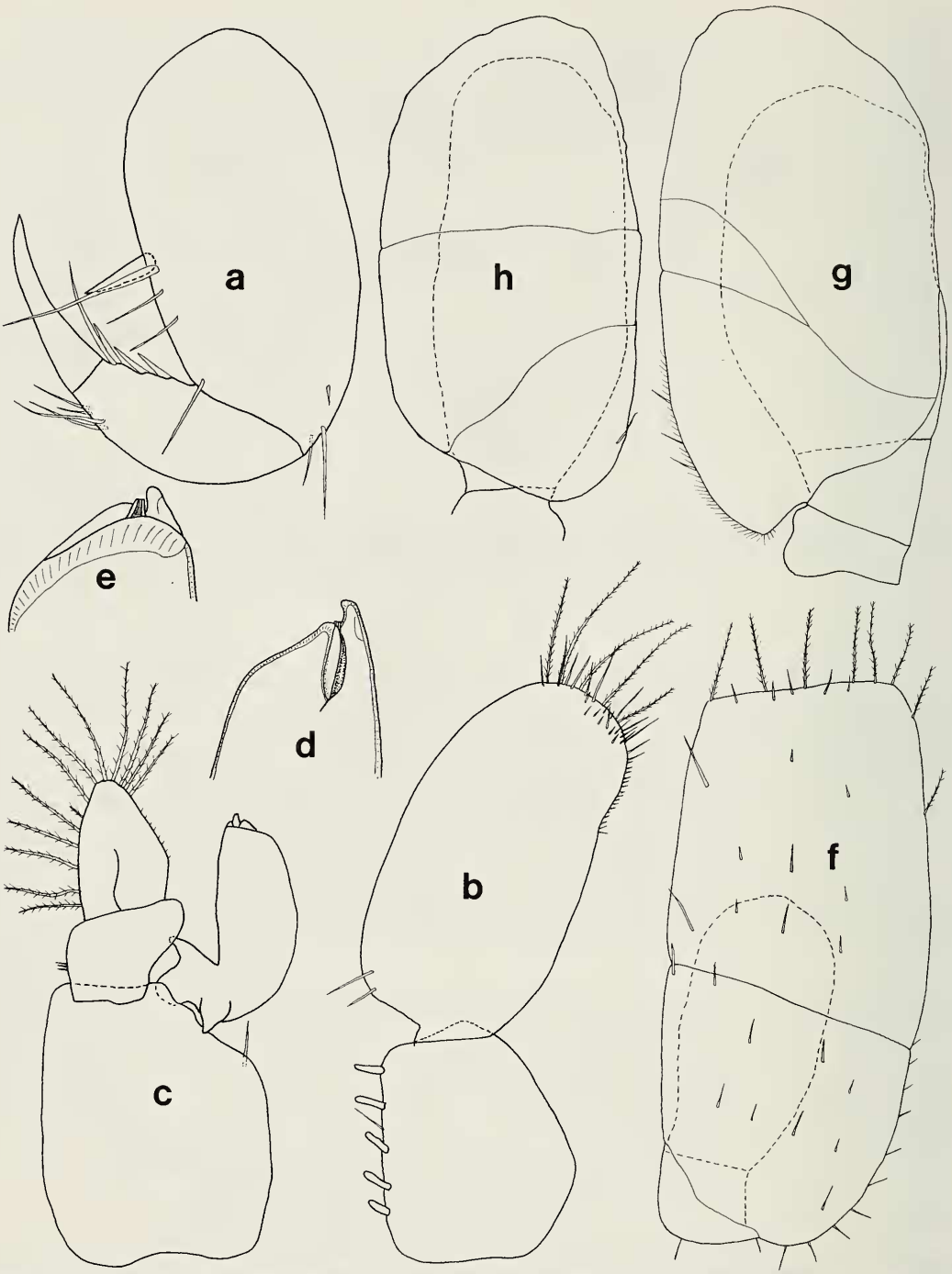

Fig. 7. *Caecidotea fustis*: a from ovigerous female, Taum Sauk Mountain; b–h from male paratype, Meramec Caverns: a, Pereopod 1; b, Pleopod 1; c, Pleopod 2; d, Same, tip of endopod, anterior; e, Same, posterior; f, Pleopod 3; g, Pleopod 4; h, Pleopod 5.

5 plumose setae on distal margin and short setae on concave distal part of lateral margin. Male pleopod 2 exopod, proximal segment with about 3 lateral setae, distal segment subtriangular, bearing about 13 plumose setae along lateral and distal margins; endopod with prominent basal apophysis,

tip with 4 processes: (1) cannula obscured by other processes, forming low truncate conical extension of endopodial groove; (2) mesial process broad, suboval, distally rounded; (3) lateral process high, digitiform, slightly recurved laterally, with low subtriangular flange on caudal surface; and (4) caudal process forming heavily sclerotized band, broadening laterally, across posterior distal part of endopod.

Pleopod 3 about 2.1× as long as wide, distal segment about 1.3× length of proximal segment, distal margin with about 6–7 long, plumose setae. Pleopod 4, exopod with setae along proximal lateral margin, single oblique sigmoid suture present. Pleopod 5 with proximal seta, 2 weak sutures.

Uropods of male spatulate, about 1.7× length of telson, exopod distinctly club-shaped in mature males. Uropods of female cylindrical, equal or subequal to length of telson.

Etymology.—The name, proposed as a noun, is derived from the Latin "fustis" (=club), referring to the appearance of the uropods of mature males.

Relationships.—The general morphological affinities of *Caecidotea fustis* are with the members of the *Hobbsi* Group, sharing with other members of this group the shape and distal setation of the male pleopod 1, and the low, truncate distally extending cannula. Specifically, *C. fustis* may be related to *C. stiladactyla*. The male pereopod 1 of these species is quite similar in most specimens, although in large specimens of *C. fustis* the proximal spine present on the palmar margin of the propus in both species is replaced by a large, triangular process. The endopod tips of *C. fustis* and *C. stiladactyla* are similar in that each possesses a truncate, conical cannula which is nearly obscured by other, somewhat digitiform processes. However, *C. stiladactyla* exhibits a phenomenon which has not been reported to occur in other asellids, i.e., the cannula has both recumbent and erect positions, and apparently is capable of a telescoping motion within the tip of the endopod. Fleming (1972) illustrated both positions, but the recumbent position appears to be the endopod tip of *C. fustis* (reported from Onyx Cave, Missouri by Fleming) rather than that of *C. stiladactyla*. Besides the lack of the telescoping cannula, *C. fustis* is pigmented in some collections, while pigmentation is unknown in *C. stiladactyla,* and the male pleopod 1 of *C. fustis* bears distal plumose setae which are absent in *C. stiladactyla*.

Habitat and distribution.—*Caecidotea fustis* is known only from caves and seeps in a narrow north-south band lying between Washington and Iron counties, Missouri. This area, on the western flank of the St. François Mountains, is within the northeastern part of the Salem Plateau. *Caecidotea fustis* is allopatric with *C. stiladactyla,* which is apparently known authentically only from localities in Arkansas which are adjacent to the edge of the Salem Plateau.

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